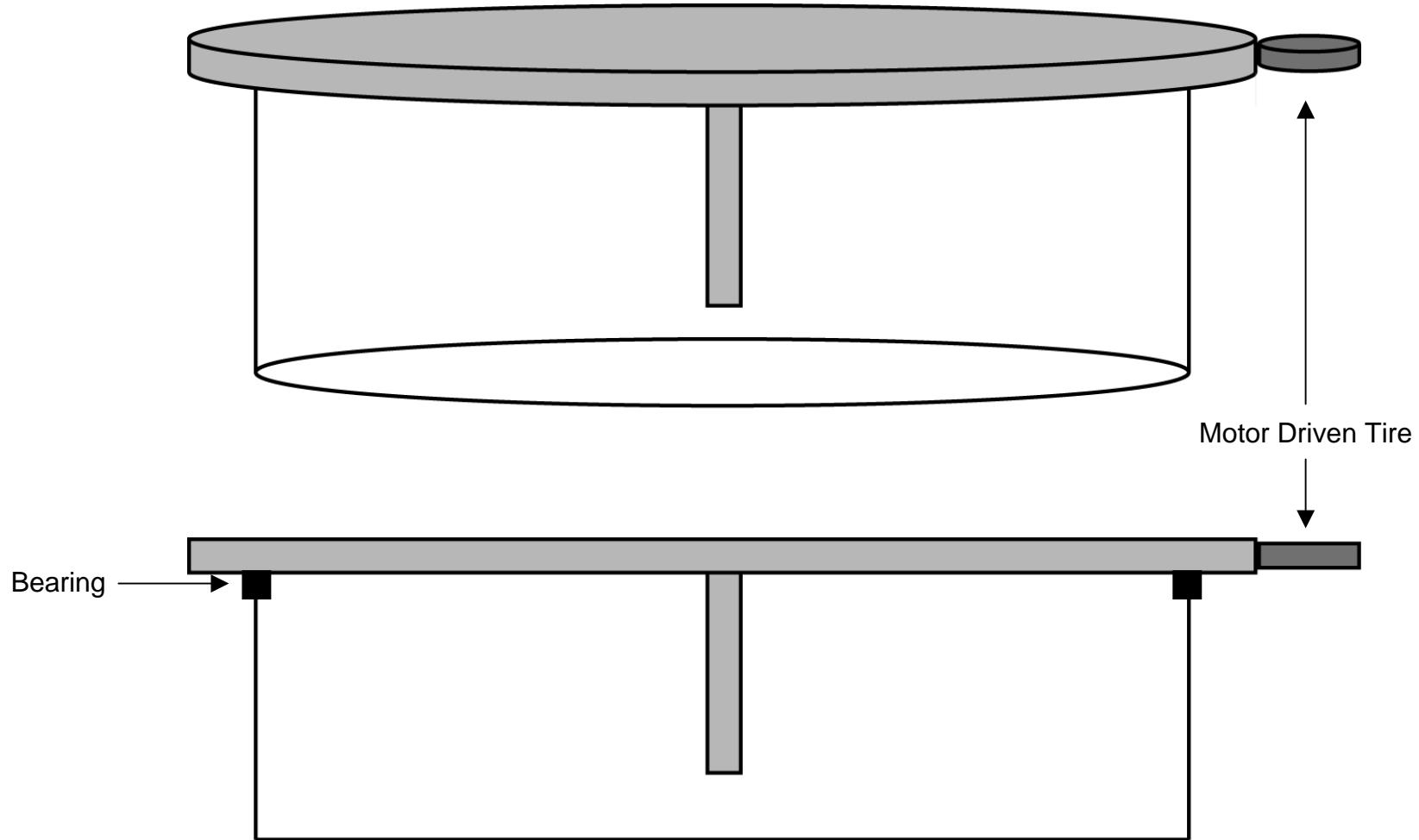




Radio Antenna Turntable System (RATS)

Rhonda Blair
John Carroll
Cameron McKay
Pierce Ruggles

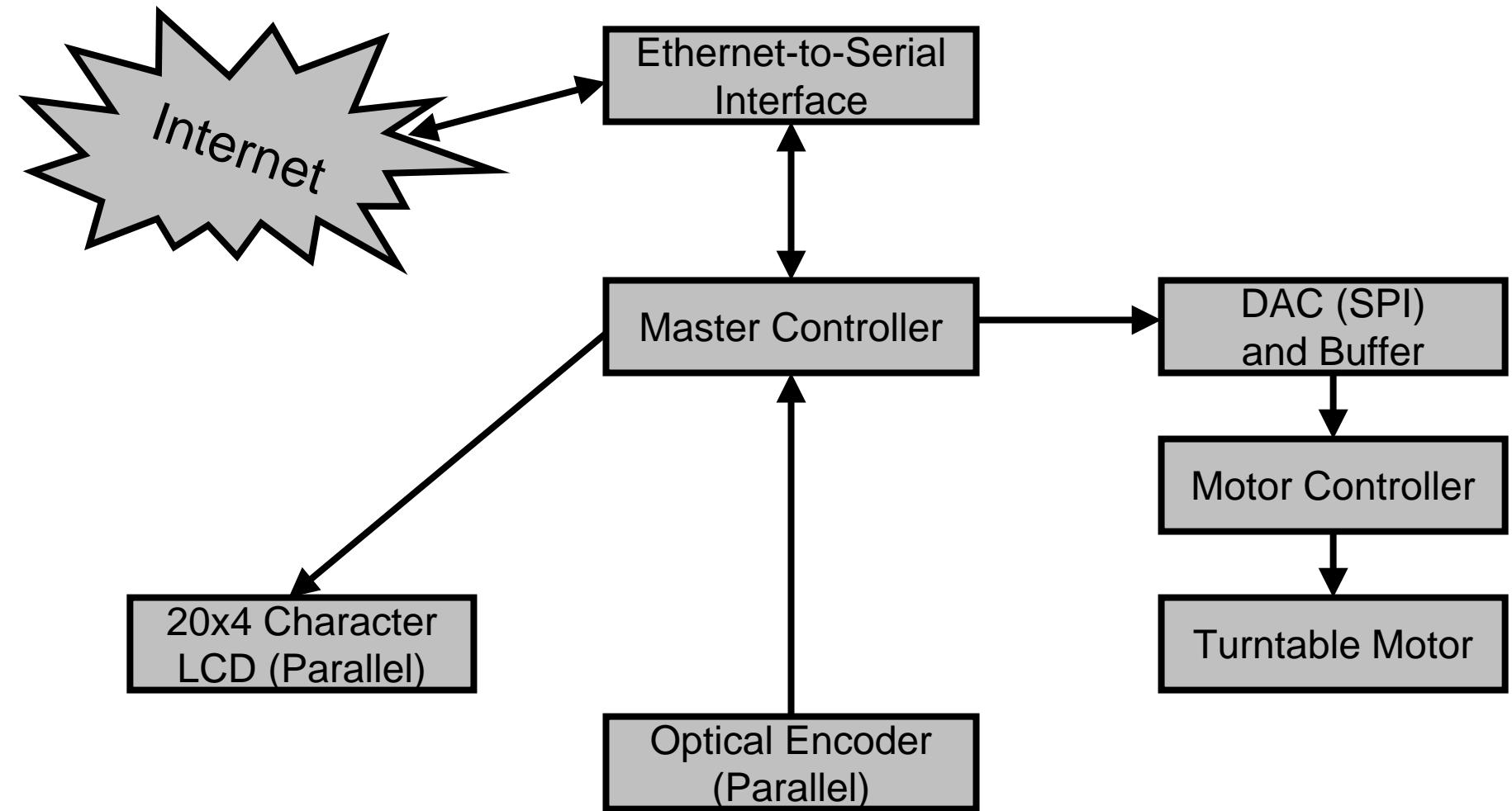
Turntable Illustration



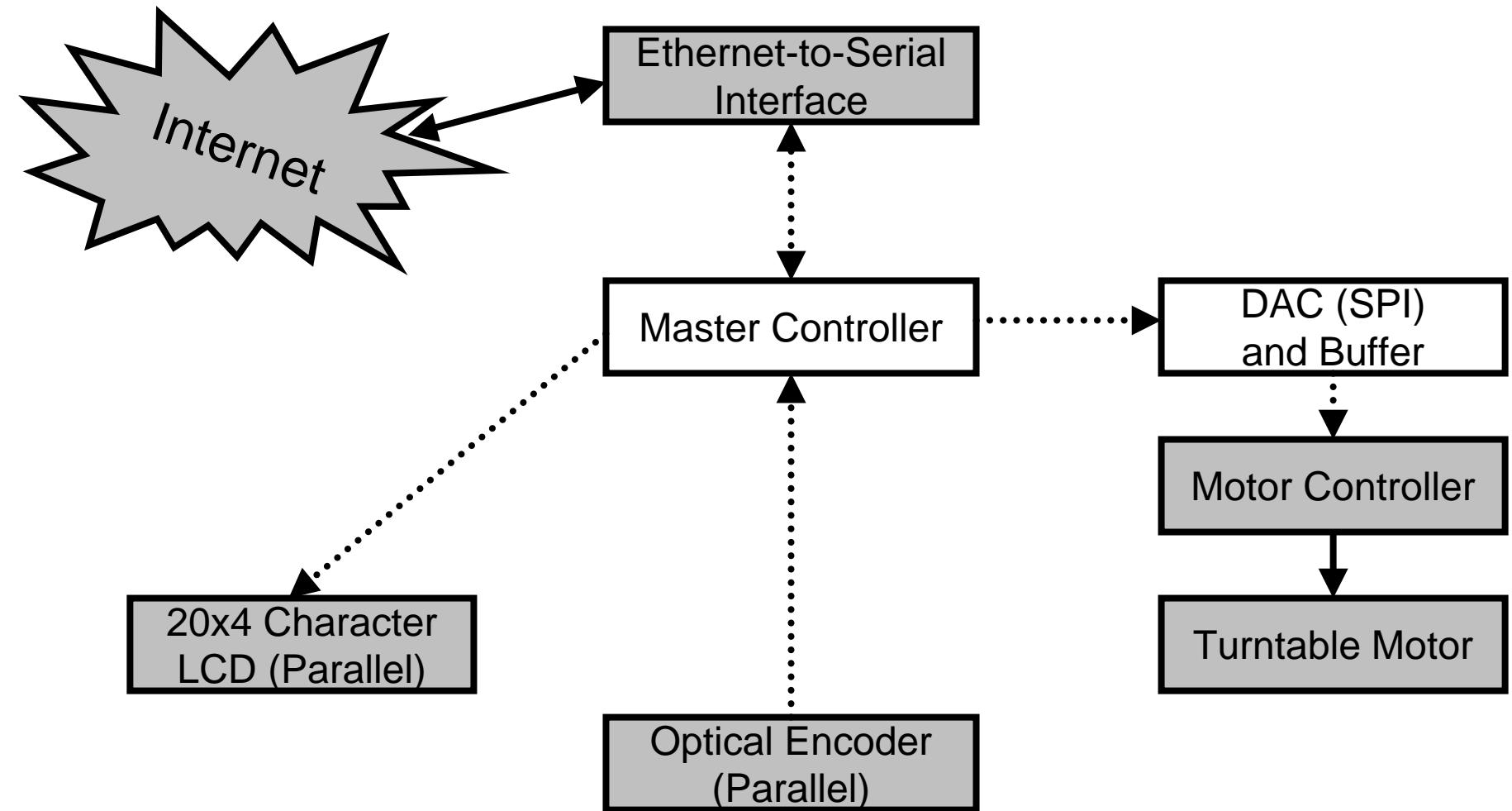
Turntable Illustration



Project Block Diagram



Project Block Diagram



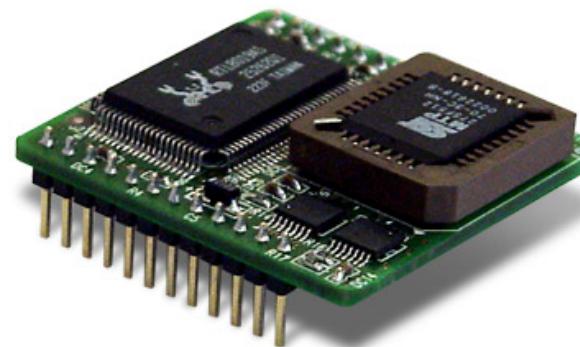
Encoder Drama

- Original encoder was defective
 - Incremental
 - Pulse output
- New encoder on order
 - Absolute
 - Parallel output
 - (memory mapped)

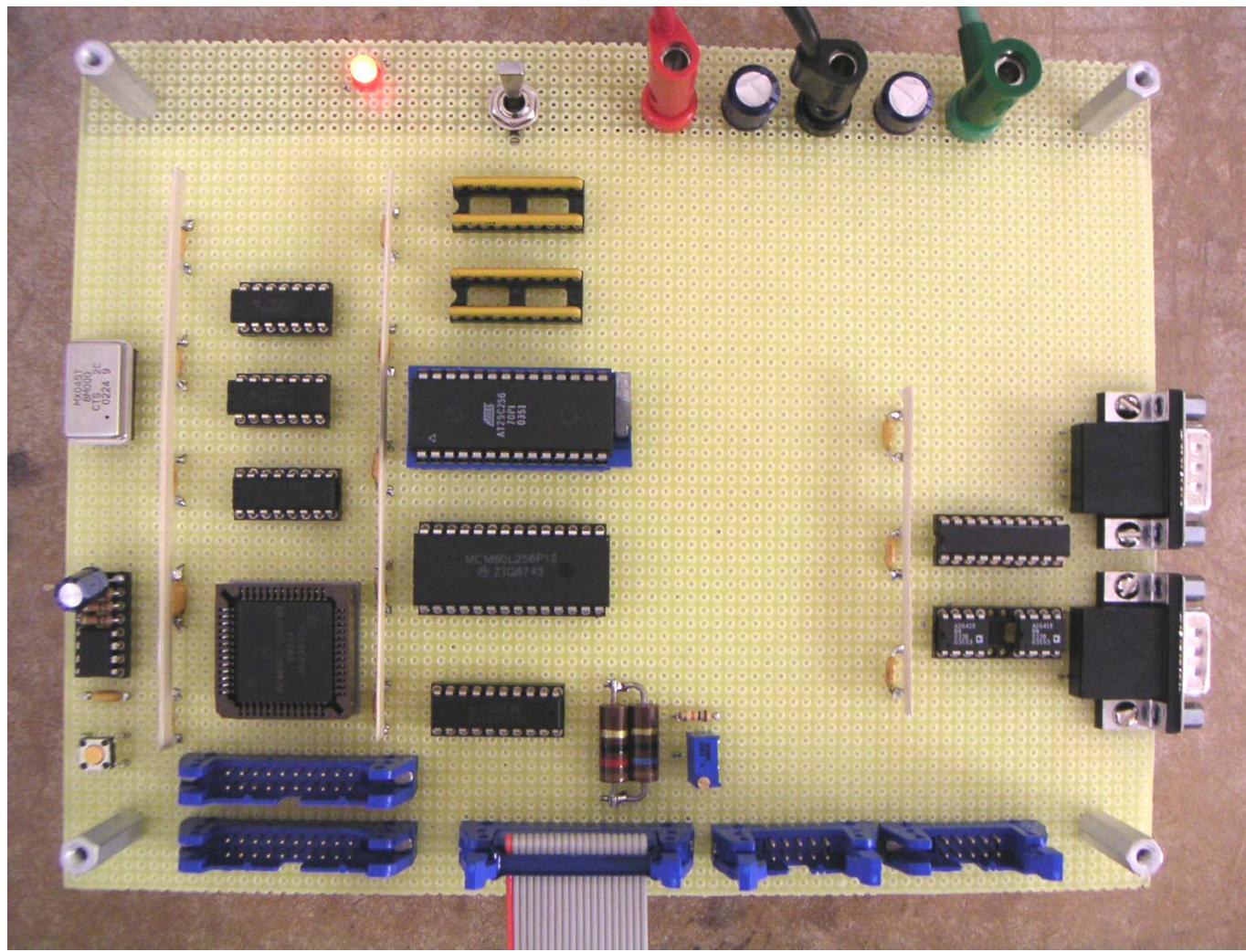


Network Interface

- Converts Ethernet to RS-232
- Onboard 8051 Microcontroller
- Built-in TCP/IP stack
- Telnet protocol
 - Username/password authentication



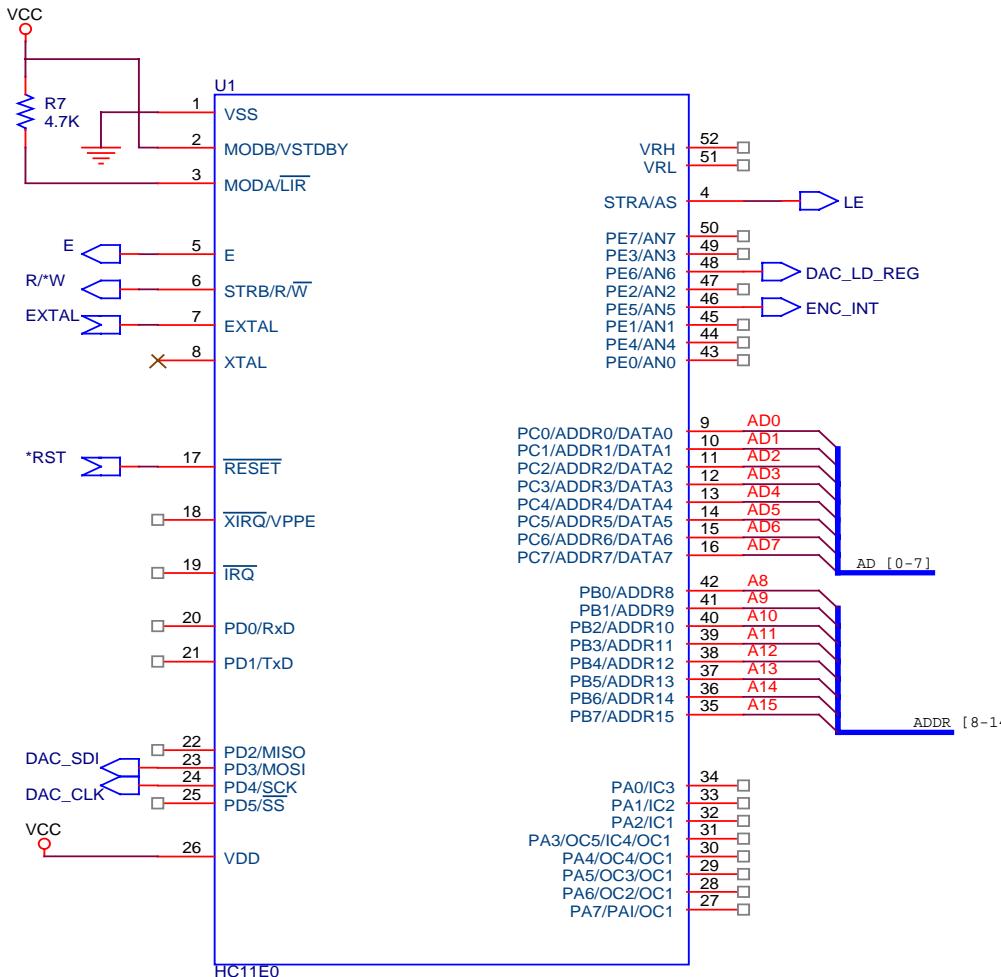
Master Controller



Features:

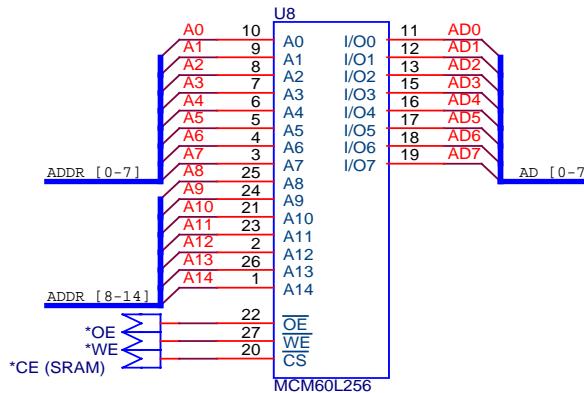
- HC11E0 MCU
- 32K SRAM
- 32K Flash
- 2x RS-232
- 8 MHz clock

Master Controller

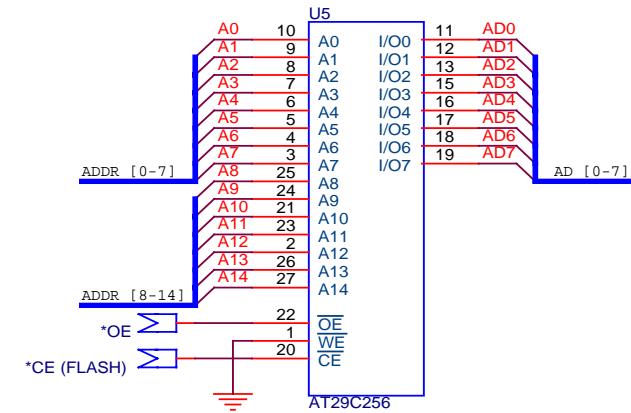


Master Controller

32K SRAM (MCM60L256)

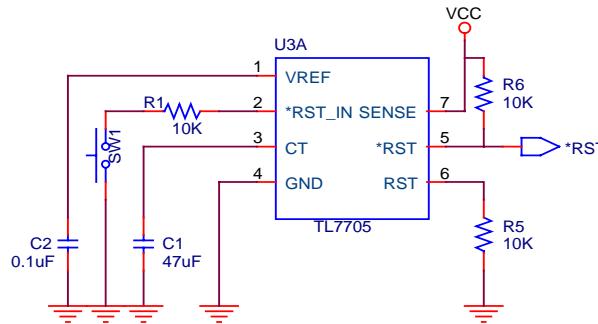


32K Flash (AT29C256)

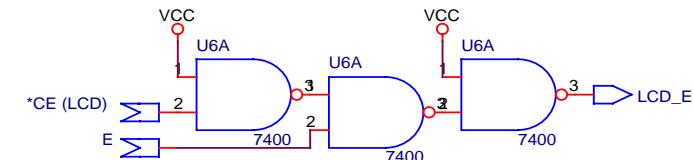


Master Controller

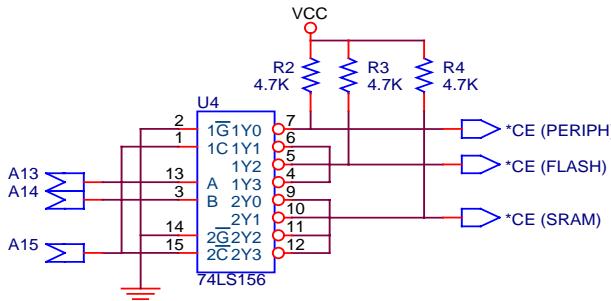
Supervisor/Reset Circuit



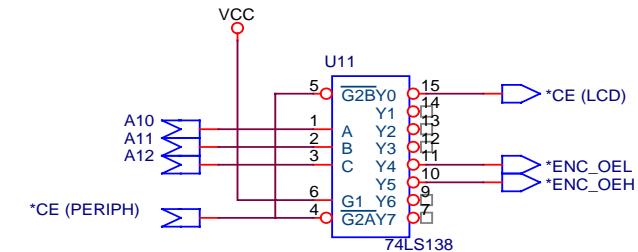
LCD Enable Logic



Chip Select Logic

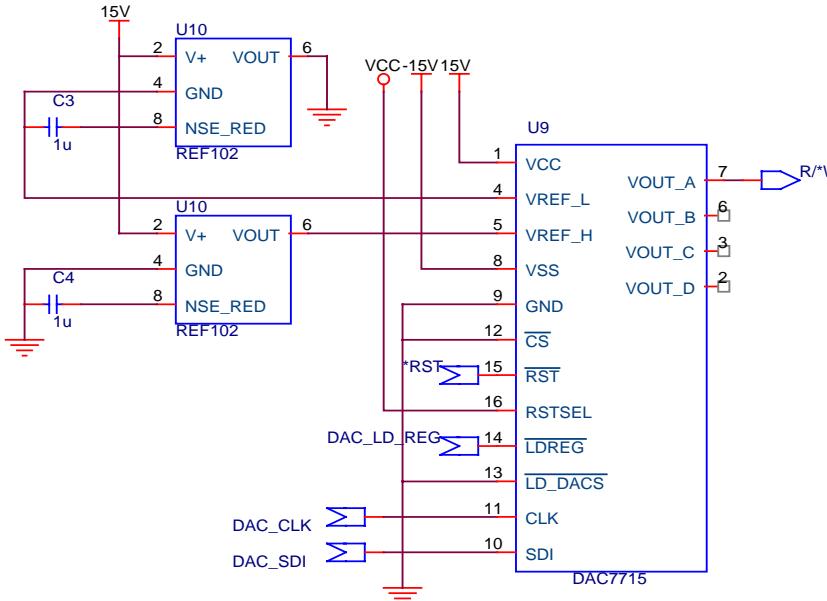


Peripheral Chip Select Logic

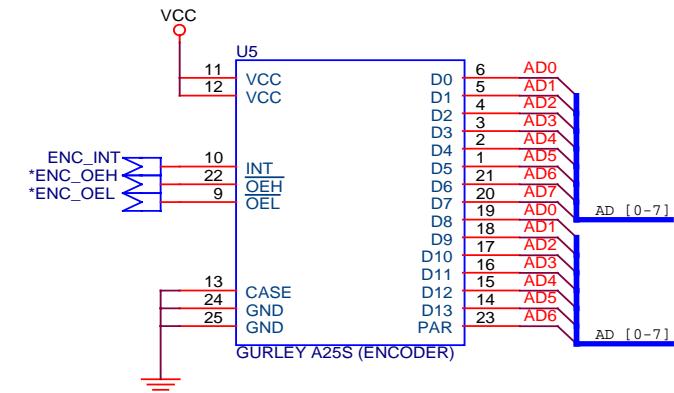


Master Controller

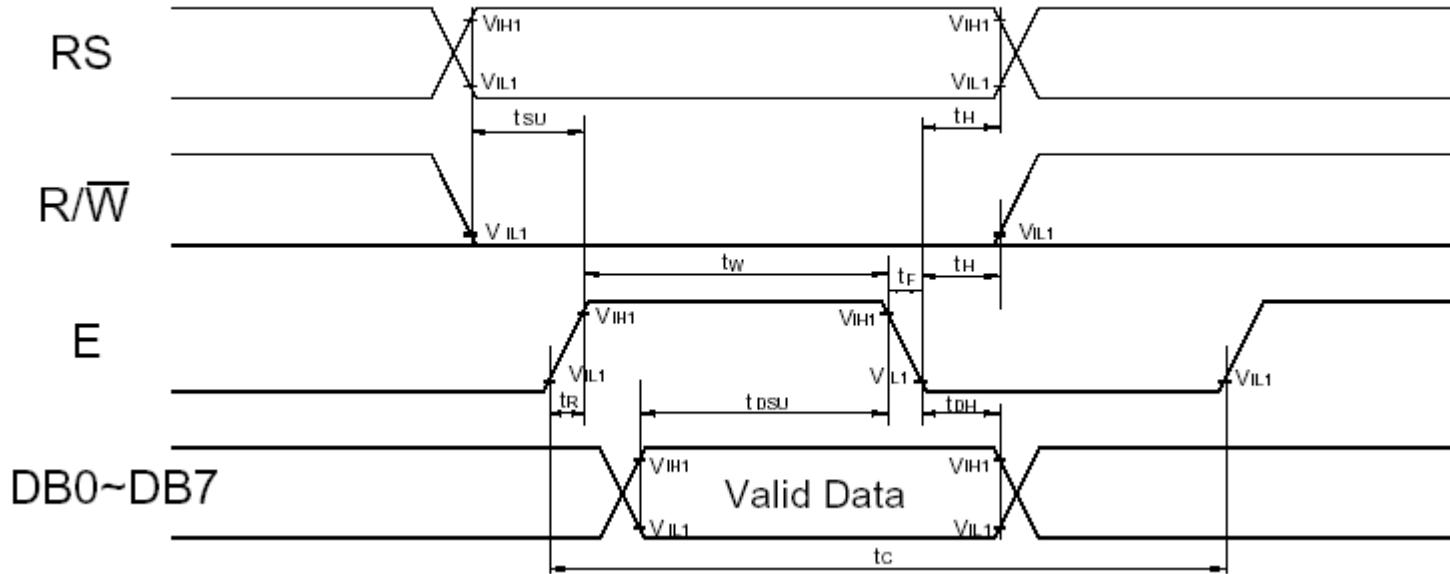
DAC



Encoder

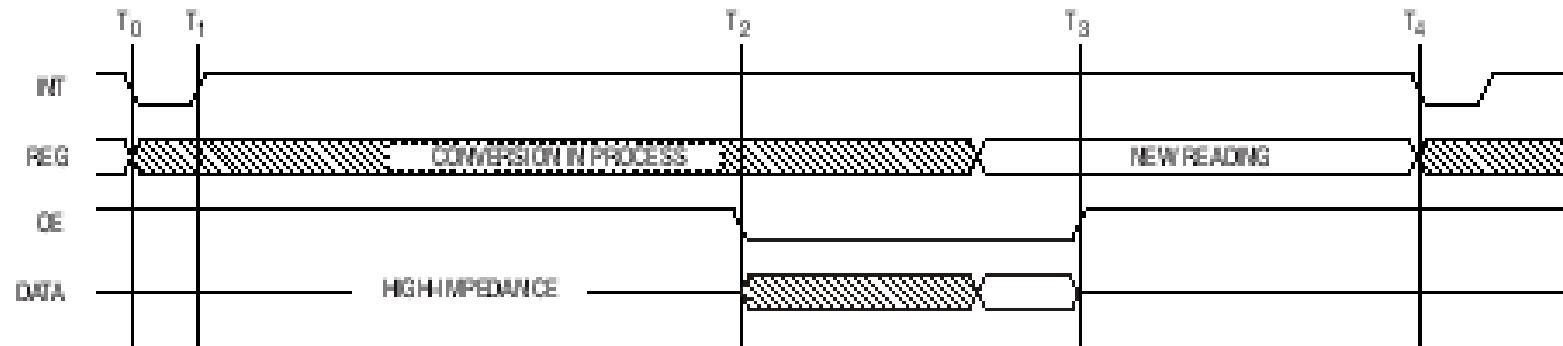


Master Controller



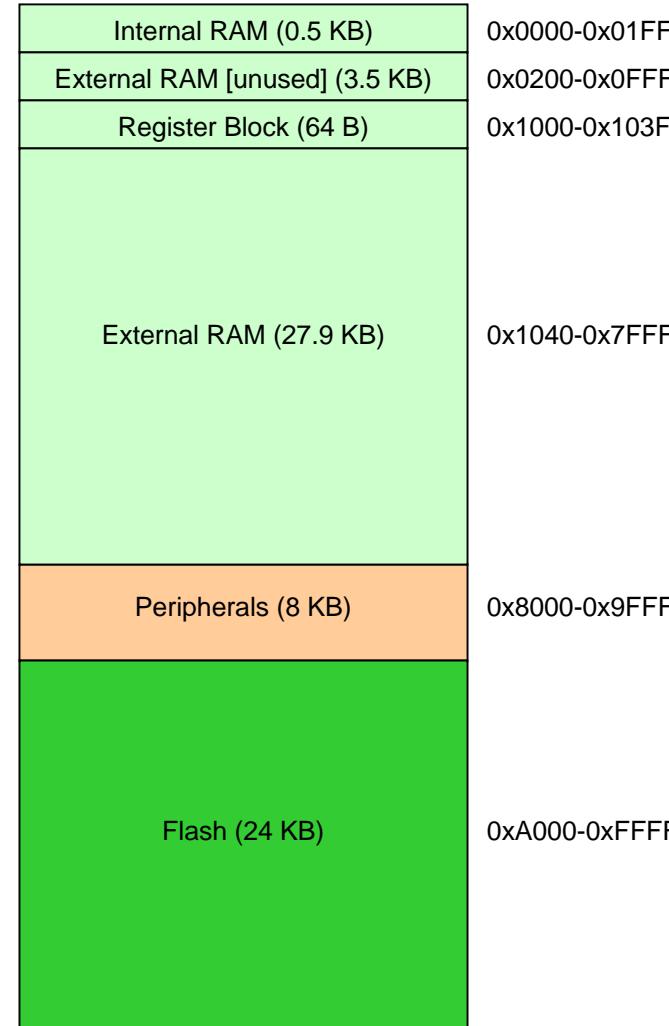
LCD Write Timing Diagram

Master Controller



Encoder Timing Diagram

Memory Map



Software Components

- Bootloader/Monitor
 - Loads code through RS-232 into SRAM
 - Displays SRAM, register contents
- RS-232 Driver
 - Initialization, port selection, read/write text
- LCD Driver
 - Simple interface to read/write from LCD
- Encoder Driver
 - Reads and formats encoder position data
 - Calculates turntable velocity

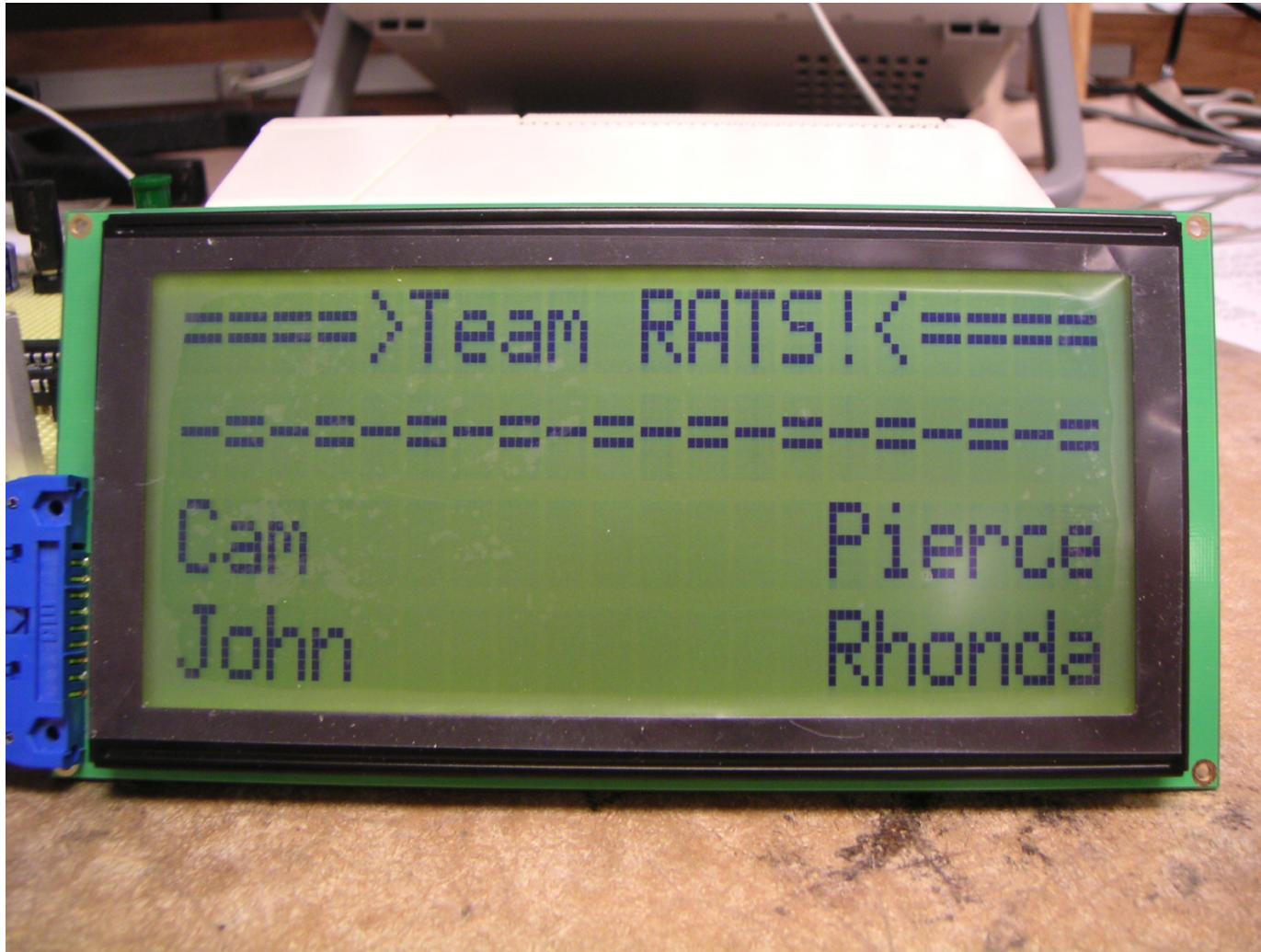
Software Components

- DAC Driver
 - Simple interface to write data to the SPI DAC
- Ethernet Driver
 - Telnet initialization, input/output
- User Interface
 - Text menus/input handling
- Control System
 - Acceleration/braking calculations
 - Uses encoder data as input
 - Writes to DAC as output

Current Status

- Hardware status:
 - Basic functionality complete
 - Encoder, DAC in progress
- Software status:
 - LCD driver complete
 - RS-232 driver in progress

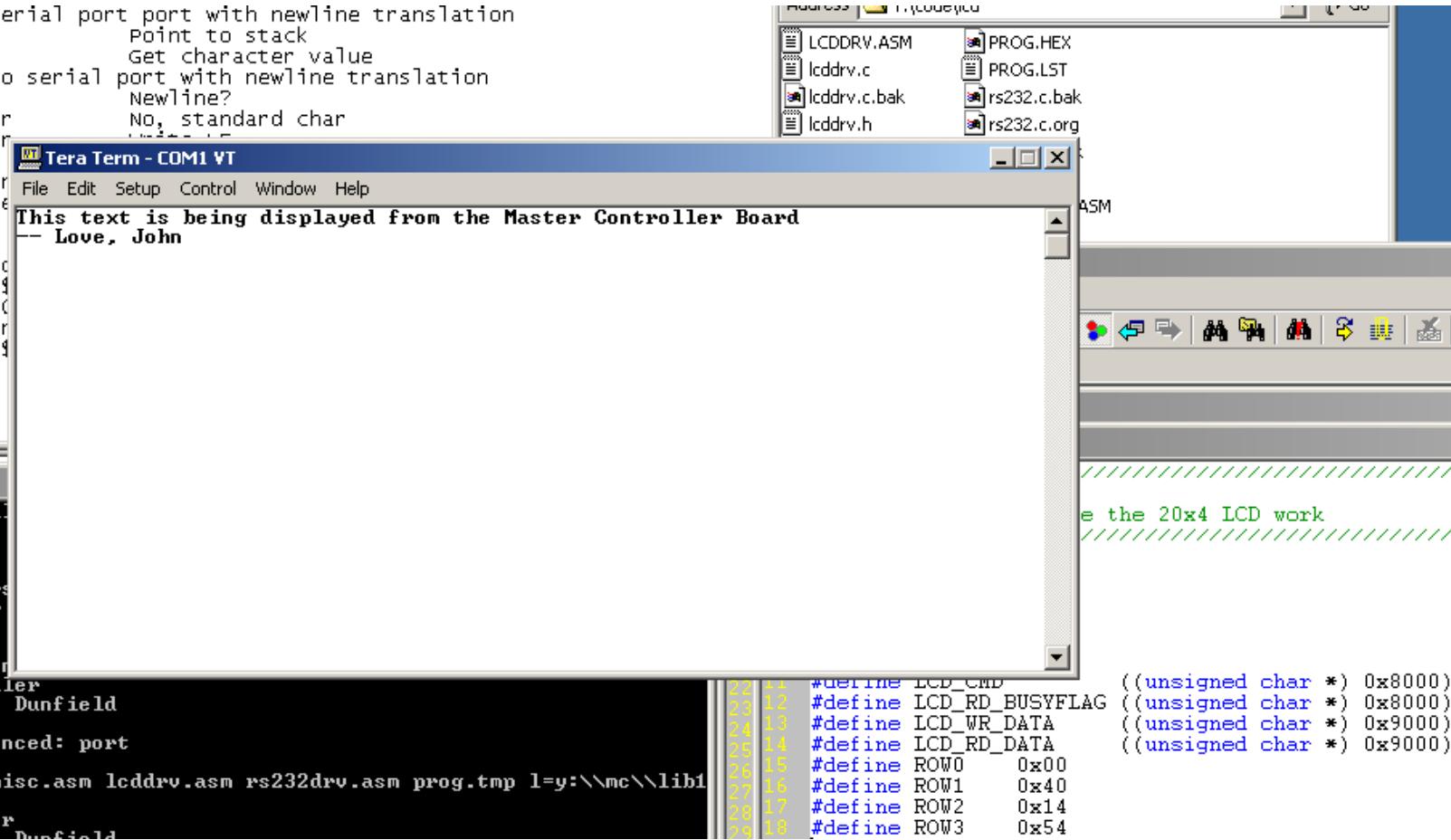
Current Status



Current Status

```
* Write character to serial port port with newline translation
putch  TSX      Point to stack
       LDD  2,X      Get character value
* write character(B) to serial port with newline translation
?putch CMPB   #$0A      Newline?
       BNE  ?putchr    No, standard char
       BSR  ?putchr
       LDAB  #$0D
       BRA  ?putchr
* write character to se
putchr TSX      Point to stack
       LDD  2,X      Get character value
* write character(B) to
?putchr LDAA   ?REGS+$1
       BITA  #%"10000
       BEQ   ?putchr
       STAB  ?REGS+$1
       RTS
*03220 17/2/2004
```

```
C:\WINNT\system32\cmd.exe
S MICRO-C 68HC11 Compiler
Copyright 1988-2002 Dave
Dunfield
l rights reserved.
l lcddrv.tmp
\\mc\\mcp rs232drv.c rs
S MICRO-C Preprocessor
Copyright 1989-2002 Dave
Dunfield
l rights reserved.
\\mc\\mc11 rs232drv.tr
S MICRO-C 68HC11 Compiler
Copyright 1988-2002 Dave Dunfield
l rights reserved.
rs232drv.c(33): Unreferenced: port
l rs232drv.tmp
\\mc\\slink main.asm misc.asm lcddrv.asm rs232drv.asm prog.tmp l=y:\\mc\\lib1
=extindex.lib
S MICRO-C Source Linker
Copyright 1988-2002 Dave Dunfield
```



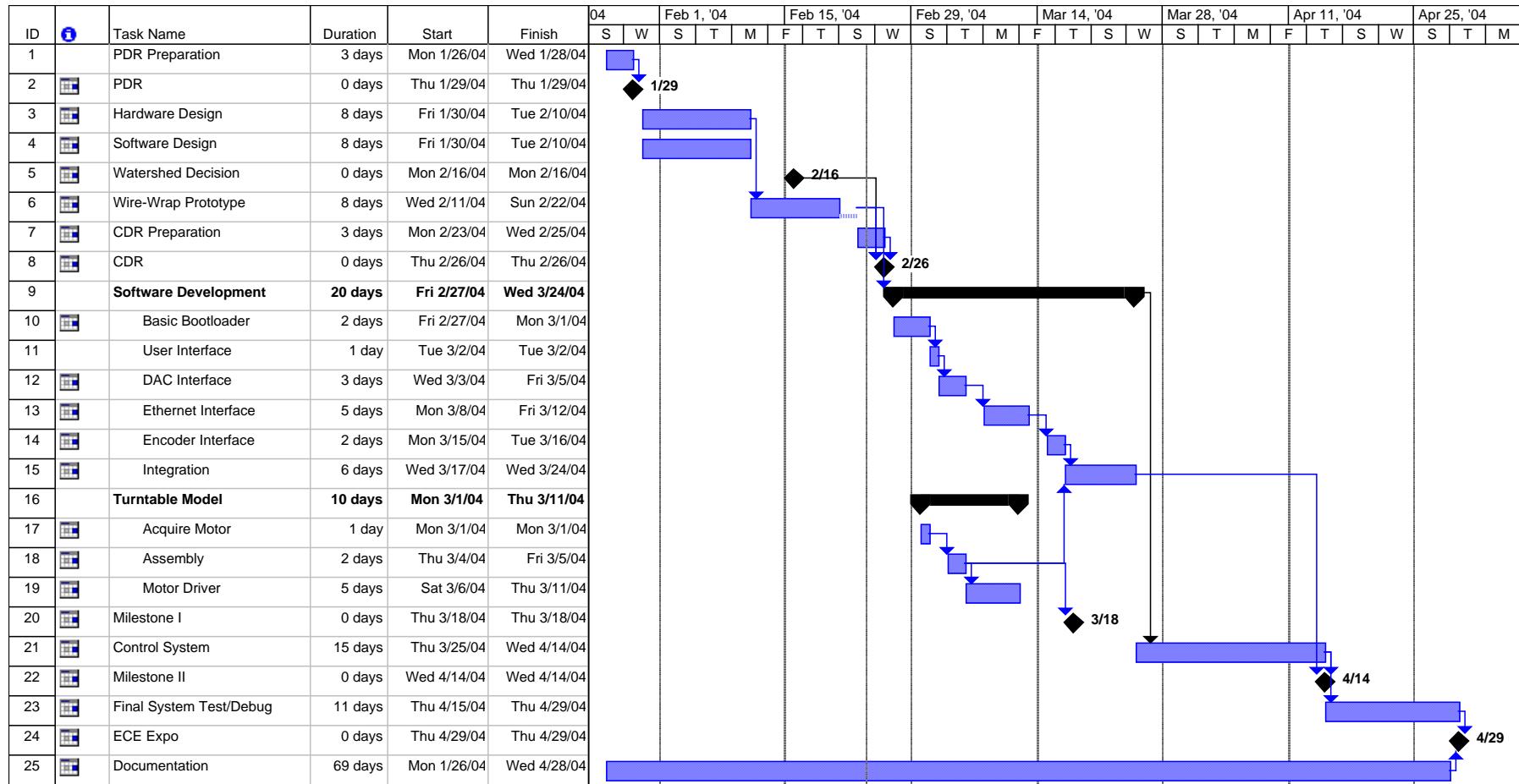
Parts List

• MC68HC11E0 (MCU)	\$9
• AT29C256 (32K Flash)	\$7
• MCM60L256 (32K SRAM)	\$6
• MAX233EPP (RS-232)	\$9
• ADG419 (RS-232 Switches)	\$6 (\$3x2)
• ACM2004E (LCD)	\$75
• A25S (Shaft Encoder)	\$1900
• DAC7715 (DAC)	\$18

Parts List

• REF102 (10V reference)	\$10 (\$5x2)
• TL7705 (Supervisor)	\$1
• 74LS373 (Latch)	\$.50
• 74LS156, 74LS138 (CS)	\$1 (\$.50 ea)
• 74HC00 (NAND)	\$.60 (\$.30x2)
• LS100M	\$69
• Total	\$2112

Schedule



Schedule

- M1 Deliverables:
 - Physical turntable model
 - Software modules
- M2 Deliverables:
 - Module integration
 - Control system
- Expo Deliverables:
 - Functioning turntable model
 - Position/Speed control
 - Documentation

Schedule

- Division of Labor
 - Programming tasks shared by two people, will rotate
 - Turntable model will be a group effort

Questions?